PATENT ABSTRACTS OF JAPAN

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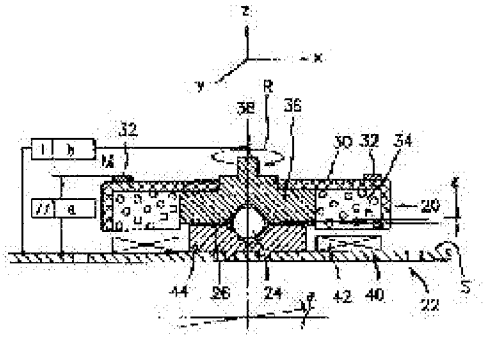
(54) MOTOR MANUFACTURING METHOD

(57)Abstract:

PURPOSE: To provide a motor manufacturing method by which the number of parts and processes is cut, cost is reduced, and reliability is improved.

CONSTITUTION: A motor manufacturing method comprises a step for forming a rotor assembly 20 by outsert molding a magnet 34 and rotor bearing 36 to a rotor housing 30, step for forming a stator assembly 22 by outsert molding a stator bearing 44 to a stator base plate 40 and locating a coil assembly 42, and step for assembling the rotor assembly 20 and stator assembly 22 by providing a gap ε between the rotor bearing 36 and stator bearing 44 with lubricant 26 and ball 24 put between the rotor bearing 36 and stator bearing 44.



CLAIMS

[Claim(s)]

[Claim 1]A manufacturing method of a motor characterized by comprising the following.

A step which carries out the outsert mold of a magnet board and the rotor-shaft holder part to rotor housing, and forms a rotor part.

A step which the outsert mold of the stator shaft holder part is carried out to a stator substrate, and arranges a coil and forms a stator part, A step which arranges lubricant and a ball between said rotor-shaft holder part and

said stator shaft holder part, provides a gap between said rotor-shaft holder part and said stator shaft holder part, and assembles said rotor part and said stator part.

[Claim 2]A manufacturing method of the motor according to claim 1 which a coil of said stator part counters with said rotor part magnet board, and is arranged.

[Claim 3]A manufacturing method of the motor according to claim 1 or 2 which said magnet board makes contain magnetic powder in a plastic, and is formed.

[Claim 4]A manufacturing method of the motor according to claim 1 by which a portion which receives said ball of said 1st bearing and said 2nd bearing is formed in section triangular shape.

[Claim 5]A manufacturing method of the motor according to claim 1 in which said stator substrate is sheet metal.

[Claim 6]A manufacturing method of the motor according to claim 1 which carries out the outsert mold of the table part which carries a recording medium to said rotor housing in a step which forms said rotor part simultaneously with said rotor-shaft holder part.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the manufacturing method of a what is called face facing type motor especially about the manufacturing method of a motor.

[0002]

[Description of the Prior Art]Information media, for example, a magnetic recording medium like a floppy disk (FD),
an optical recording medium like a compact disk (CD), or an optical magnetic recording medium like a mini disc (MD) is rotated, In reproducing the information which records information to this recording medium, or is recorded on the recording medium, it uses the spindle motor as shown in drawing 9.

[0003]The spindle motor of drawing 9 has the rotor part 1 and the stator part 2. The rotor part 1 has the chuck table part 5 and the rotor housing 6 which carry out the zipper of the magnet board 3, the axis 4, and the recording medium. This axis 4 is pressed fit in the rotor housing 6 of the rotor part 1. On the chassis mounting part 7, the stator part 2 attaches the coil 8 and, moreover, attaches the bearing 9. The axis 4 is inserted in the bearing 9 and the axis 4 is pivotable via the hard ball 10. The conventional motor shown in drawing 9 is a what is called face facing type motor which the magnet board 3 and the coil 8 are made to counter.

[0004]The manufacturing method of this conventional motor is explained one by one with reference to drawing 10 thru/or drawing 18. As shown in drawing 10, the rotor housing 6 is produced with a sheet metal press (process 1). Next, the axis 4 is machined and manufactured as shown in drawing 11 (process 2). As shown in drawing 12, the magnet board 3 is made by fabricating and magnetizing a plastic magnet (processes 3 and 4). As

shown in drawing 13, the chuck table part 5 is fabricated (process 5).
[0005]Next, the axis 4 is pressed fit in the hole 6a of the rotor housing 6 as shown in drawing 14 (process 6). And the magnet board 3 and the chuck table part 5 are pasted up to the rotor housing 6. The rotor part 1 which this also calls a rotor assembly can be made (process 7).
[0006]On the other hand, as shown in drawing 15, a sheet metal press is carried out and the chassis mounting part 7 is made (process 8). As shown in drawing 16, to this chassis mounting part 7, the coil 8 is carried and, in addition to this, a circuit is also carried (process 9).
[0007]Next, the bearing 9 is formed as shown in drawing 17 (process 10). and it is shown in drawing 18 -- as -- this bearing 9 -- the hole 7a of the chassis mounting part 7 -- press fit -- you make it vomit and it attaches. The stator part 2 which this also calls a stator assembly is formed (process 11). Thus, as the rotor part 1 and the stator part 2 which were obtained are shown in drawing 9, they are assembled. That is, the hard ball 10 which applied the lubricating oil to the bearing 9 is put in, and the axis 4 of the rotor part 1 is inserted in the bearing 9 of the stator part 2, and is received by the hard ball 10. By energizing in the coil 8, it can be rotated now by the rotor part 1 in the direction of arrow R to the stator part 2 via the axis 4.
[0008]
[Problem(s) to be Solved by the Invention]However, in this kind of motor, the inclination theta to the field of the chuck table part 5, i.e., an angle, is small, and when realizing record/reproduction to a recording medium with stable being settled in tolerance level, it is required. Thus, in order to make the angle theta small, the following conditions are needed on manufacture. Since it is necessary to hold accuracy, assembling some parts, respectively when making the rotor part 1 and making the

stator part 2, it is necessary to make accuracy of each component parts high.
[0009]moreover -- receiving [in / in pressing the axis 4 fit to the rotor housing 6 **** / the stator part 2] the chassis mounting part 7 in the bearing 9 in the rotor part 1 -- press fit -- you make it vomit and it is necessary to attach And in the rotor part 1, it is necessary to paste up the magnet board 3 and the chuck table part 5 to the rotor housing 6. In these processes, these press fits, a caulking, or adhesion accuracy changes with a worker's skill, the factors of the accuracy of a jig, etc. easily. For this reason, it has been [rather than it is easy] an obstacle of the cost cut to lessen time which processing takes or to secure the stable accuracy of a necessary part. Concern of the variation in a quality side always cannot be eliminated, either.
[0010]By the way, in order to store the angle theta of inclination to the field of the chuck table part 5 of drawing
9 in a certain tolerance level, it is necessary to stop the accuracy of the parallelism a and the squareness b. The parts which participate in the accuracy of the parallelism a are six parts, and the processes of participating in the accuracy of the parallelism a are three processes. The parts which participate in the accuracy of this parallelism a are six parts of the chassis mounting part 7 of the stator part 2, the bearing 9, the hard ball 10, the axis 4, the rotor housing 6, and the chuck table part 5. As a process of participating in the accuracy of the parallelism a, they are press fit or the caulking process of the chassis mounting part 7 of the stator part 1, and the bearing 9, a press fit process to the rotor housing 6 of the axis 4, and a bonding process of the rotor housing 6 and the chuck table part 5. The system accuracy of the parts which participate in the accuracy of these parallelism a, and the process of participating in the

accuracy of the parallelism a influences the parallelism a.
[0011]There is 1 ** as a process of participating in the accuracy of those with 3 parts, and the squareness b as parts which participate in the squareness b. As parts which participate in the accuracy of the squareness b, they are the chassis mounting part 7 of the stator part 1, the bearing 9, and the axis 4. As a process of participating in the accuracy of the squareness b, it is press fit or the caulking process of the chassis mounting part 7 of the stator part 1, and the bearing 9. The system accuracy of the squareness b is the system accuracy of the parts which participate in the accuracy of the squareness b, and the process of participating in the accuracy of the squareness b.
[0012]And there are the seven numbers of parts by making rotor housing 6 into the start, and there are 11 routing counters, as shown in drawing 18 from drawing 10. The reduction of the number of parts and the reduction of a routing counter in the cases of manufacturing a this kind of face facing type motor from this are
called for strongly.
[0013]Then, this invention can be made in order to cancel an aforementioned problem, reduction of the number of parts and reduction of a routing counter can be aimed at, the cost cut by this can be aimed at, and it aims at providing the manufacturing method of the motor which can moreover improve reliability.
[0014]
[Means for Solving the Problem]A step which carries out the outsert mold of a magnet board and the rotor-shaft holder part to rotor housing, and forms a rotor part if the above-mentioned purpose is in this invention, A step which the outsert mold of the stator shaft holder part is carried out to a stator substrate, and arranges a coil and forms a stator part, Lubricant and a ball are arranged

between said rotor-shaft holder part and said stator shaft holder part, a gap is provided between said rotor-shaft holder part and said stator shaft holder part, and it is attained by a manufacturing method of a motor provided with a step which assembles said rotor part and said stator part.

[0015]If it is in this invention, preferably, a coil of said stator part counters with said rotor part magnet board, and is arranged. If it is in this invention, preferably, said magnet board includes magnetic powder in a plastic, and
is formed.

[0016]If it is in this invention, a portion which receives said ball of said 1st bearing and said 2nd bearing preferably is formed in section triangular shape. If it is in this invention, said stator substrate is sheet metal preferably. If it is in this invention, simultaneously with said rotor-shaft holder part, in a step which forms said rotor part preferably, the outsert mold of the table part which carries a recording medium is carried out to said rotor housing.

[0017]

[Function]according to the above-mentioned composition -- a rotor part and a stator part -- and it can reduce to a total of three numbers of parts of a ball, and, moreover, a routing counter can also be reduced.

[0018]

[Example]Hereafter, the suitable example of this invention is described in detail based on an accompanying drawing. since the example described below is a suitable example of this invention, desirable various limitation is attached technically, but the range in particular of this invention is not restricted to these modes, as long as there is no statement of the purport that this invention is limited in the following explanation.

[0019]Drawing 1 shows the desirable example of the motor

for explaining the manufacturing method of the motor of this invention. With reference to drawing 1, the structure of this motor is explained first. This motor is a face facing type motor in which what is called the rotor part 20 and the stator part 22 are carrying out face facing. The rotor part 20 has the rotor housing 30, the chuck table part 32, the magnet board 34, and the rotor-shaft holder part 36.

[0020]To the rotor housing 30, the magnet board 34 and the chuck table part 32 are attached by adhesion. The rotor-shaft holder part 36 is formed by the outsert mold to the rotor housing 30. At the center of the rotorshaft holder part 36, it has the projection 38 for inserting in the hole of a compact disk, for example. The stator part 22 has the chassis mounting part 40 as a stator substrate, the coil 42 and the stator shaft holder part 44, a required circuit, etc., and this coil 42 is arranged focusing on the stator shaft holder part 44 at that circumference.

[0021]Between the rotor-shaft holder part 36 and the stator shaft holder part 44, the lubricating oil 26 as the hard ball 24 and lubricant is arranged. The rotor-shaft holder part 36 is equipped with the hard ball holder part of section triangular shape, for example. The hard ball holder part which receives the hard ball 24 in the stator shaft holder part 44 similarly is formed. M shown by drawing 1 shows the media clamp faces, such as a compact disk, and S shows the chassis clamp face of the motor. theta of drawing 1 shows the face deflection angle of media clamp face M to chassis clamp face S.

epsilon shows the gap formed between the rotor part 20 called rotor assembly and the stator part 22 called stator assembly.

[0022]By energizing in the coil 42, it can be rotated now by the rotor part 20 in the direction of arrow R to the stator part 22. By having such a rotor-shaft holder part 36, the stator shaft holder part 44 and the hard ball 24, and composition using the lubricating oil 26, the size in the shaft orientations of this motor can be made small.
[0023]Next, the manufacturing method of the rotor part 20 of this motor is explained with reference to drawing 2 thru/or drawing 5, and drawing 6 thru/or drawing 8 explain the manufacturing method of the stator part 22.
[0024]First, drawing 2 thru/or drawing 5 explain the manufacturing method of the rotor part 20 in detail. As shown in drawing 2, the rotor housing 30 fabricates a metal plate with a sheet metal press, for example, and forms the hole 30a in the central part of this rotor housing 30 (process 1).
[0025]Next, as shown in drawing 3, the outsert mold of the plastic magnet part 34 is carried out inside the rotor housing 30 (process 2). As this plastic magnet, what mixed iron magnetic powder with nylon, for example can be used.
[0026]Next, as shown in drawing 4, outsert molding of the rotor-shaft holder part 36 of a plastic and the chuck table part 32 of a plastic is simultaneously carried out to the rotor housing 30 (process 3). A general plastic can be used [others / the plastic (PPS) for outsert molds, for example, polyphenyl styrene etc.,] for this rotor-shaft holder part 36 and chuck table part 32. At this time, to the hole 30a of the rotor housing 30, as the projection 38 of the rotor-shaft holder part 36 by which the outsert mold was carried out is projected, it is formed. Thus, the outsert mold of the plastic magnet part 34 is carried out to the rotor housing 30, integral moulding is carried out to it, and then two steps of molding of carrying out integral moulding according the bearing 36 and the chuck table part 32, to the outsert mold of a plastic

simultaneously are performed to this.
[0027]Next, as shown in drawing 5, it magnetizes to the magnet board 34 of a plastic magnet (process 4). Thereby, the rotor part 20 can be made.
[0028]Next, drawing 6 thru/or drawing 8 explain the manufacturing method of the stator part 22. The chassis mounting part 40 of stator part 22 ** carries out a sheet metal press, and fabricates a metal plate, for example (process 5). A cold rolled steel plate can be used as a material of this sheet metal press. As shown in drawing 7, the outsert mold of a plastic is carried out to the chassis mounting part 40, and the stator shaft holder part 44 is formed (process 6). This stator shaft holder part 44 is fixable by the hole 40a of a chassis mounting part. As the stator shaft holder part 44, a general plastic can be used [others / the plastic (PPS) for outsert molds, for example, polyphenyl styrene etc.,], for example.
[0029]Next, as shown in drawing 8, the coil 42 and its circuit (not shown) are carried in the circumference of the stator shaft holder part 44 (process 7). Thereby, the stator part 22 can be completed. As shown in drawing 5, in the rotor-shaft holder part 36, it has the tapered shape holder part 36b of the hard ball 24. As similarly shown in drawing 8, in the stator shaft holder part 44, it has the tapered shape holder part 44b of the hard ball 24.
[0030]Thus, the rotor part 20 and the stator part 22 which were made are assembled as follows. As shown in drawing 1, the rotor part 20 is made to meet to the stator part 22, and it assembles via the hard ball 24 and the lubricating oil 26. Under the present circumstances, the hard ball 24 holds the gap epsilon between the rotorshaft holder part 36 and the stator shaft holder part 44. By energizing in the coil 42, it can be rotated by the rotor part 20 in the direction of arrow R to the stator part 22.
[0031]In the structure of the motor of the example of such

this invention, in order to store the angle theta of inclination to the field of the chuck table part 32 in a certain tolerance level, it is necessary to hold the accuracy
of the parallelism a and the squareness b to a certain value.

[0032]In the example of drawing 1, the parts which participate in the accuracy of the parallelism a are three parts. The processes of participating in the accuracy of the parallelism a are two processes. That is, the parts which participate in the accuracy of the parallelism a are three parts of the stator part 22, the hard ball 24, and the rotor part 20. And the process which the process of participating in the accuracy of the parallelism a carries out the outsert mold of the rotor-shaft holder part 36 and the chuck table part 32 to the rotor housing 30 of the rotor part 20, and carries out integral moulding, They are a total of two processes of the process of carrying out the outsert mold of the stator shaft holder part 44 to the chassis mounting part 40 of the stator part 22, and carrying out integral moulding to it. The parts which participate in these parallelism a, and the process of participating in the accuracy of the parallelism a become the system accuracy about the parallelism a.

[0033]Next, the parts which participate in the accuracy of the squareness b in the example of drawing 1, and the process of participating in the accuracy of the squareness b are the same as the parts which participate in the accuracy of the parallelism a, respectively, and the process of participating in the accuracy of the parallelism a.

That is, the parts which participate in the accuracy of the squareness b, and the process of participating in the accuracy of the squareness b are the system accuracy of the squareness b. Thus, the number of the parts about
the parallelism a and the squareness b in the case of

manufacturing the motor of Example 1 and the number of processes can be substantially reduced compared with the motor of a conventional example.

[0034]In the example of drawing 1, the numbers of parts are three parts of the stator part 22, the rotor part 20, and the hard ball 24, as mentioned above. And routing counters are a total of seven processes shown in drawing 2 thru/or drawing 8.

[0035]Therefore, about part mark, it can decrease from seven conventional parts to three parts in the example of this invention, and part mark can be reduced to 43% as compared with a conventional example. About a routing counter, although it was 11 process necessity by the motor of the conventional example, it ends at seven processes by the example of the motor of this invention. Therefore, compared with a conventional example, a routing counter is reducible to 64% by the motor of the example of this invention. When manufacturing the example of the motor of this invention from these things, a large cost cut can be aimed at.

[0036]It depends for the work of press fit, a caulking or adhesion, etc., etc. on the accuracy of a jig, or a worker's
skill in a conventional example. However, what is necessary is just to carry out the outsert mold of the resin to rotor housing, or to carry out the outsert mold of the resin to a chassis mounting part in the manufacturing method of the motor of this invention, using a metallic mold and resin. Thus, the fixed accuracy level which exists when accuracy is mainly uniquely decided by mold accuracy and the plastic material characteristic and it manufactures a motor by use of an outsert molding step is securable. For this reason, compared with the conventional press fit in a manufacturing method, caulking, or bonding process of a motor, it is reliable.

[0037]By the way, this invention is not limited to the

above-mentioned example. Although the example mentioned above explains the motor made with the manufacturing method of this invention as a thing turning around an optical recording medium like a compact disk, It can also use not only this but in order to rotate information media, for example, a magnetic recording medium like a floppy disk (FD), or an optical magnetic recording medium like a mini disc (MD), for example. The motor made with the manufacturing method of this invention can also be used for, making optical elements, such as a laser polygon mirror, carry and rotate for example, or twisting and driving magnetic tape etc.

[0038]

[Effect of the Invention]As explained above, according to this invention, reduction of the number of parts and reduction of a routing counter can be aimed at, the cost cut by this can be aimed at, and, moreover, reliability can be improved.

TECHNICAL FIELD

[Industrial Application]This invention relates to the manufacturing method of a what is called face facing type motor especially about the manufacturing method of a motor.

PRIOR ART

[Description of the Prior Art]Information media, for example, a magnetic recording medium like a floppy disk (FD),
an optical recording medium like a compact disk (CD), or an optical magnetic recording medium like a mini disc (MD) is rotated, In reproducing the information which records information to this recording medium, or is recorded on the recording medium, it uses the spindle motor as shown in drawing 9.

[0003]The spindle motor of drawing 9 has the rotor part 1 and the stator part 2. The rotor part 1 has the chuck table part 5 and the rotor housing 6 which carry out the zipper of the magnet board 3, the axis 4, and the recording medium. This axis 4 is pressed fit in the rotor housing 6 of the rotor part 1. On the chassis mounting part 7, the stator part 2 attaches the coil 8 and, moreover, attaches the bearing 9. The axis 4 is inserted in the bearing 9 and the axis 4 is pivotable via the hard ball 10. The conventional motor shown in drawing 9 is a what is called face facing type motor which the magnet board 3 and the coil 8 are made to counter.

[0004]The manufacturing method of this conventional motor is explained one by one with reference to drawing 10 thru/or drawing 18. As shown in drawing 10, the rotor housing 6 is produced with a sheet metal press (process 1). Next, the axis 4 is machined and manufactured as shown in drawing 11 (process 2). As shown in drawing 12, the magnet board 3 is made by fabricating and magnetizing a plastic magnet (processes 3 and 4). As shown in drawing 13, the chuck table part 5 is fabricated (process 5).

[0005]Next, the axis 4 is pressed fit in the hole 6a of the rotor housing 6 as shown in drawing 14 (process 6). And the magnet board 3 and the chuck table part 5 are pasted up to the rotor housing 6. The rotor part 1 which

this also calls a rotor assembly can be made (process 7).
[0006]On the other hand, as shown in drawing 15, a sheet metal press is carried out and the chassis mounting part 7 is made (process 8). As shown in drawing 16, to this chassis mounting part 7, the coil 8 is carried and, in addition to this, a circuit is also carried (process 9).
[0007]Next, the bearing 9 is formed as shown in drawing 17 (process 10). and it is shown in drawing 18 -- as -- this bearing 9 -- the hole 7a of the chassis mounting part 7 -- press fit -- you make it vomit and it attaches.
The stator part 2 which this also calls a stator assembly is formed (process 11). Thus, as the rotor part 1 and the stator part 2 which were obtained are shown in drawing 9, they are assembled. That is, the hard ball 10 which applied the lubricating oil to the bearing 9 is put in, and the axis 4 of the rotor part 1 is inserted in the bearing 9 of the stator part 2, and is received by the hard ball 10. By energizing in the coil 8, it can be rotated now by the rotor part 1 in the direction of arrow R to the stator part 2 via the axis 4.

EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, according to this invention, reduction of the number of parts and reduction of a routing counter can be aimed at, the cost cut by this can be aimed at, and, moreover, reliability can be improved.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in this kind of motor, the inclination theta to the field of the chuck table part 5, i.e., an angle, is small, and when realizing record/reproduction to a recording medium with stable being settled in tolerance level, it is required. Thus, in order to make the angle theta small, the following conditions are needed on manufacture. Since it is necessary to hold accuracy, assembling some parts, respectively when making the rotor part 1 and making the stator part 2, it is necessary to make accuracy of each component parts high.
[0009]moreover -- receiving [in / in pressing the axis 4 fit to the rotor housing 6 **** / the stator part 2] the chassis mounting part 7 in the bearing 9 in the rotor part 1 -- press fit -- you make it vomit and it is necessary to attach And in the rotor part 1, it is necessary to paste up the magnet board 3 and the chuck table part 5 to the rotor housing 6. In these processes, these press fits, a caulking, or adhesion accuracy changes with a worker's skill, the factors of the accuracy of a jig, etc. easily. For this reason, it has been [rather than it is easy] an obstacle of the cost cut to lessen time which processing takes or to secure the stable accuracy of a necessary part. Concern of the variation in a quality side always cannot be eliminated, either.
[0010]By the way, in order to store the angle theta of inclination to the field of the chuck table part 5 of drawing 9 in a certain tolerance level, it is necessary to stop the accuracy of the parallelism a and the squareness b. The parts which participate in the accuracy of the parallelism a are six parts, and the processes of participating in the accuracy of the parallelism a are three processes. The parts which participate in the accuracy of this parallelism a are six parts of the chassis mounting part 7 of the stator part 2, the bearing 9, the

hard ball 10, the axis 4, the rotor housing 6, and the chuck table part 5. As a process of participating in the accuracy of the parallelism a, they are press fit or the caulking process of the chassis mounting part 7 of the stator part 1, and the bearing 9, a press fit process to the rotor housing 6 of the axis 4, and a bonding process of the rotor housing 6 and the chuck table part 5. The system accuracy of the parts which participate in the accuracy of these parallelism a, and the process of participating in the accuracy of the parallelism a influences the parallelism a.

[0011]There is 1 ** as a process of participating in the accuracy of those with 3 parts, and the squareness b as parts which participate in the squareness b. As parts which participate in the accuracy of the squareness b, they are the chassis mounting part 7 of the stator part 1, the bearing 9, and the axis 4. As a process of participating in the accuracy of the squareness b, it is press fit or the caulking process of the chassis mounting part 7 of the stator part 1, and the bearing 9. The system accuracy of the squareness b is the system accuracy of the parts which participate in the accuracy of the squareness b, and the process of participating in the accuracy of the squareness b.

[0012]And there are the seven numbers of parts by making rotor housing 6 into the start, and there are 11 routing counters, as shown in drawing 18 from drawing 10. The reduction of the number of parts and the reduction of a routing counter in the cases of manufacturing a this kind of face facing type motor from this are called for strongly.

[0013]Then, this invention can be made in order to cancel an aforementioned problem, reduction of the number of parts and reduction of a routing counter can be aimed at, the cost cut by this can be aimed at, and it aims at providing the manufacturing method of the motor which can moreover improve reliability.

MEANS

[Means for Solving the Problem]A step which carries out the outsert mold of a magnet board and the rotor-shaft holder part to rotor housing, and forms a rotor part if the above-mentioned purpose is in this invention, A step which the outsert mold of the stator shaft holder part is carried out to a stator substrate, and arranges a coil and forms a stator part, Lubricant and a ball are arranged between said rotor-shaft holder part and said stator shaft holder part, a gap is provided between said rotor-shaft holder part and said stator shaft holder part, and it is attained by a manufacturing method of a motor provided with a step which assembles said rotor part and said stator part.

[0015]If it is in this invention, preferably, a coil of said stator part counters with said rotor part magnet board, and is arranged. If it is in this invention, preferably, said magnet board includes magnetic powder in a plastic, and is formed.

[0016]If it is in this invention, a portion which receives said ball of said 1st bearing and said 2nd bearing preferably is formed in section triangular shape. If it is in this invention, said stator substrate is sheet metal preferably. If it is in this invention, simultaneously with said rotor-shaft holder part, in a step which forms said rotor part preferably, the outsert mold of the table part which carries a recording medium is carried out to said rotor housing.

OPERATION

[Function]according to the above-mentioned composition -- a rotor part and a stator part -- and it can reduce to a total of three numbers of parts of a ball, and, moreover, a routing counter can also be reduced.

EXAMPLE

[Example]Hereafter, the suitable example of this invention is described in detail based on an accompanying drawing. since the example described below is a suitable example of this invention, desirable various limitation is attached technically, but the range in particular of this invention is not restricted to these modes, as long as there is no statement of the purport that this invention is limited in the following explanation.

[0019]Drawing 1 shows the desirable example of the motor for explaining the manufacturing method of the motor of this invention. With reference to drawing 1, the structure of this motor is explained first. This motor is a face facing type motor in which what is called the rotor part 20 and the stator part 22 are carrying out face facing. The rotor part 20 has the rotor housing 30, the chuck table part 32, the magnet board 34, and the rotor-shaft holder part 36.

[0020]To the rotor housing 30, the magnet board 34 and the chuck table part 32 are attached by adhesion. The rotor-shaft holder part 36 is formed by the outsert mold to the rotor housing 30. At the center of the rotor-shaft holder part 36, it has the projection 38 for inserting in the hole of a compact disk, for example. The stator part 22 has the chassis mounting part 40 as a stator substrate, the coil 42 and the stator shaft holder part 44, a required circuit, etc., and this coil 42 is arranged focusing on the stator shaft holder part 44 at that circumference.

[0021]Between the rotor-shaft holder part 36 and the stator shaft holder part 44, the lubricating oil 26 as the hard ball 24 and lubricant is arranged. The rotor-shaft holder part 36 is equipped with the hard ball holder part of section triangular shape, for example. The hard ball holder part which receives the hard ball 24 in the stator shaft

holder part 44 similarly is formed. M shown by drawing 1 shows the media clamp faces, such as a compact disk, and S shows the chassis clamp face of the motor. theta of drawing 1 shows the face deflection angle of media clamp face M to chassis clamp face S.
epsilon shows the gap formed between the rotor part 20 called rotor assembly and the stator part 22 called stator assembly.
[0022]By energizing in the coil 42, it can be rotated now by the rotor part 20 in the direction of arrow R to the stator part 22. By having such a rotor-shaft holder part 36, the stator shaft holder part 44 and the hard ball 24, and composition using the lubricating oil 26, the size in the shaft orientations of this motor can be made small.
[0023]Next, the manufacturing method of the rotor part 20 of this motor is explained with reference to drawing 2 thru/or drawing 5, and drawing 6 thru/or drawing 8 explain the manufacturing method of the stator part 22.
[0024]First, drawing 2 thru/or drawing 5 explain the manufacturing method of the rotor part 20 in detail. As shown in drawing 2, the rotor housing 30 fabricates a metal plate with a sheet metal press, for example, and forms the hole 30a in the central part of this rotor housing 30 (process 1).
[0025]Next, as shown in drawing 3, the outsert mold of the plastic magnet part 34 is carried out inside the rotor housing 30 (process 2). As this plastic magnet, what mixed iron magnetic powder with nylon, for example can be used.
[0026]Next, as shown in drawing 4, outsert molding of the rotor-shaft holder part 36 of a plastic and the chuck table part 32 of a plastic is simultaneously carried out to the rotor housing 30 (process 3). A general plastic can be used [others / the plastic (PPS) for outsert molds, for example, polyphenyl styrene etc.,] for this rotor-shaft holder part 36 and chuck table part 32. At this time, to the hole 30a of the rotor housing 30, as the projection 38 of the rotor-

shaft holder part 36 by which the outsert mold was carried out is projected, it is formed. Thus, the outsert mold of the plastic magnet part 34 is carried out to the rotor housing 30, integral moulding is carried out to it, and then two steps of molding of carrying out integral moulding according the bearing 36 and the chuck table part 32, to the outsert mold of a plastic simultaneously are performed to this.

[0027]Next, as shown in drawing 5, it magnetizes to the magnet board 34 of a plastic magnet (process 4). Thereby, the rotor part 20 can be made.

[0028]Next, drawing 6 thru/or drawing 8 explain the manufacturing method of the stator part 22. The chassis mounting part 40 of stator part 22 ** carries out a sheet metal press, and fabricates a metal plate, for example (process 5). A cold rolled steel plate can be used as a material of this sheet metal press. As shown in drawing 7, the outsert mold of a plastic is carried out to the chassis mounting part 40, and the stator shaft holder part 44 is formed (process 6). This stator shaft holder part 44 is fixable by the hole 40a of a chassis mounting part. As the stator shaft holder part 44, a general plastic can be used [others / the plastic (PPS) for outsert molds, for example, polyphenyl styrene etc.,], for example.

[0029]Next, as shown in drawing 8, the coil 42 and its circuit (not shown) are carried in the circumference of the stator shaft holder part 44 (process 7). Thereby, the stator part 22 can be completed. As shown in drawing 5, in the rotor-shaft holder part 36, it has the tapered shape holder part 36b of the hard ball 24. As similarly shown in drawing 8, in the stator shaft holder part 44, it has the tapered shape holder part 44b of the hard ball 24.

[0030]Thus, the rotor part 20 and the stator part 22 which were made are assembled as follows. As shown in drawing 1, the rotor part 20 is made to meet to the stator part 22, and it assembles via the hard ball 24 and the lubricating

oil 26. Under the present circumstances, the hard ball 24 holds the gap epsilon between the rotor-shaft holder part 36 and the stator shaft holder part 44. By energizing in the coil 42, it can be rotated by the rotor part 20 in the direction of arrow R to the stator part 22.

[0031]In the structure of the motor of the example of such this invention, in order to store the angle theta of inclination to the field of the chuck table part 32 in a certain tolerance level, it is necessary to hold the accuracy of the parallelism a and the squareness b to a certain value.

[0032]In the example of drawing 1, the parts which participate in the accuracy of the parallelism a are three parts. The processes of participating in the accuracy of the parallelism a are two processes. That is, the parts which participate in the accuracy of the parallelism a are three parts of the stator part 22, the hard ball 24, and the rotor part 20. And the process which the process of participating in the accuracy of the parallelism a carries out the outsert mold of the rotor-shaft holder part 36 and the chuck table part 32 to the rotor housing 30 of the rotor part 20, and carries out integral moulding, They are a total of two processes of the process of carrying out the outsert mold of the stator shaft holder part 44 to the chassis mounting part 40 of the stator part 22, and carrying out integral moulding to it. The parts which participate in these parallelism a, and the process of participating in the accuracy of the parallelism a become the system accuracy about the parallelism a.

[0033]Next, the parts which participate in the accuracy of the squareness b in the example of drawing 1, and the process of participating in the accuracy of the squareness b are the same as the parts which participate in the accuracy of the parallelism a, respectively, and the process of participating in the accuracy of the parallelism a. That is, the parts which participate in the accuracy of

the squareness b, and the process of participating in the accuracy of the squareness b are the system accuracy of the squareness b. Thus, the number of the parts about the parallelism a and the squareness b in the case of manufacturing the motor of Example 1 and the number of processes can be substantially reduced compared with the motor of a conventional example.

[0034]In the example of drawing 1, the numbers of parts are three parts of the stator part 22, the rotor part 20, and the hard ball 24, as mentioned above. And routing counters are a total of seven processes shown in drawing 2 thru/or drawing 8.

[0035]Therefore, about part mark, it can decrease from seven conventional parts to three parts in the example of this invention, and part mark can be reduced to 43% as compared with a conventional example. About a routing counter, although it was 11 process necessity by the motor of the conventional example, it ends at seven processes by the example of the motor of this invention. Therefore, compared with a conventional example, a routing counter is reducible to 64% by the motor of the example of this invention. When manufacturing the example of the motor of this invention from these things, a large cost cut can be aimed at.

[0036]It depends for the work of press fit, a caulking or adhesion, etc., etc. on the accuracy of a jig, or a worker's skill in a conventional example. However, what is necessary is just to carry out the outsert mold of the resin to rotor housing, or to carry out the outsert mold of the resin to a chassis mounting part in the manufacturing method of the motor of this invention, using a metallic mold and resin. Thus, the fixed accuracy level which exists when accuracy is mainly uniquely decided by mold accuracy and the plastic material characteristic and it manufactures a motor by use of an outsert molding step is securable. For this reason, compared with the conventional press fit in a

manufacturing method, caulking, or bonding process of a motor, it is reliable.

[0037]By the way, this invention is not limited to the above-mentioned example. Although the example mentioned above explains the motor made with the manufacturing method of this invention as a thing turning around an optical recording medium like a compact disk, It can also use not only this but in order to rotate information media, for example, a magnetic recording medium like a floppy disk (FD), or an optical magnetic recording medium like a mini disc (MD), for example. The motor made with the manufacturing method of this invention can also be used for, making optical elements, such as a laser polygon mirror, carry and rotate for example, or twisting and driving magnetic tape etc.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The figure showing the desirable example for explaining the manufacturing method of the motor of this invention.

[Drawing 2]The figure showing the rotor housing of a rotor part.

[Drawing 3]The figure showing the state where the outsert mold of the magnet board was carried out to the rotor housing of a rotor part.

[Drawing 4]The figure showing the state where the outsert mold of a rotor-shaft holder part and the chuck table part was carried out to the rotor housing of a rotor part.

[Drawing 5]The figure showing the completed rotor part.

[Drawing 6]The figure showing the state where the sheet metal press of the chassis mounting part of a stator part was carried out.

[Drawing 7]The figure showing the state where the outsert

mold of the stator shaft holder part was carried out to the chassis mounting part.

[Drawing 8]The figure showing the state where it equipped with the coil etc. to the chassis mounting part.

[Drawing 9]The figure showing the example for explaining the manufacturing method of the conventional motor.

[Drawing 10]The figure showing the rotor housing of the rotor part of the conventional motor.

[Drawing 11]The figure showing the axis of the conventional rotor part.

[Drawing 12]The figure showing the magnet board of the conventional rotor part.

[Drawing 13]The figure showing the chuck table part for pasting a rotor part.

[Drawing 14]The figure showing the completed conventional rotor part.

[Drawing 15]The figure showing the chassis mounting part of the conventional stator part.

[Drawing 16]The figure showing the state where the conventional chassis mounting part was equipped with the coil.

[Drawing 17]The figure showing the bearing of a stator part.

[Drawing 18]The figure showing the completed stator part.

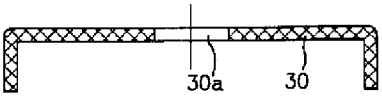
[Description of Notations]

20 Rotor part
22 Stator part
24 Hard ball
26 Lubricating oil
30 Rotor housing
32 Chuck table part (table part)
34 Magnet board
36 Rotor-shaft holder part
40 Chassis mounting part (stator part)
42 Coil
44 Stator shaft holder part
a Parallelism

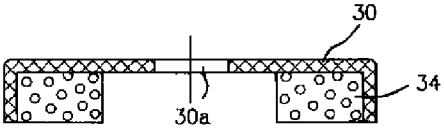
b Squareness

DRAWINGS

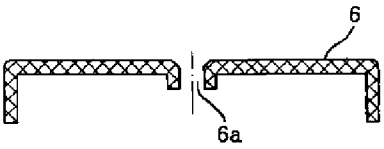
[Drawing 2]



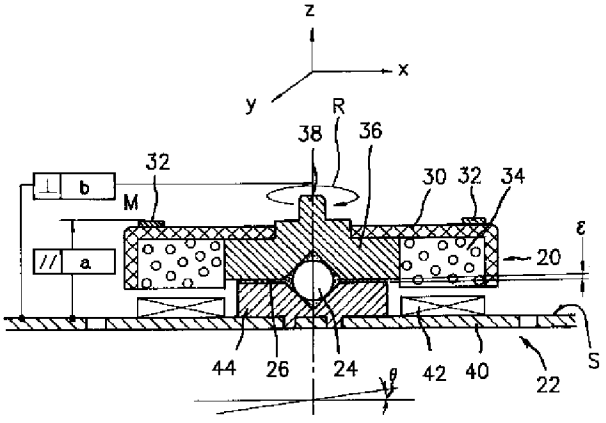
[Drawing 3]



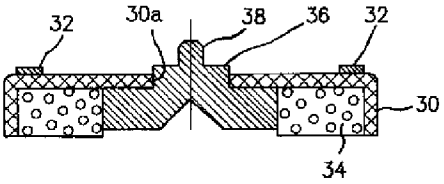
[Drawing 10]



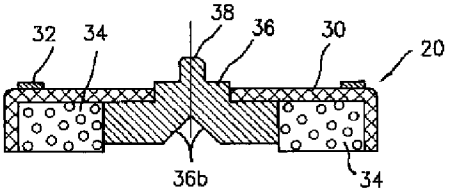
[Drawing 1]



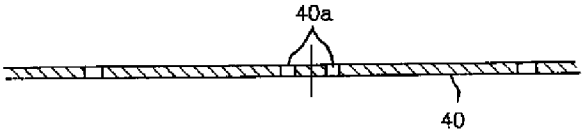
[Drawing 4]



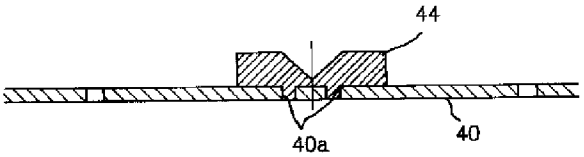
[Drawing 5]



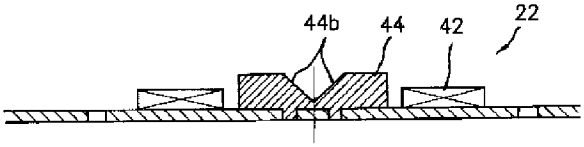
[Drawing 6]



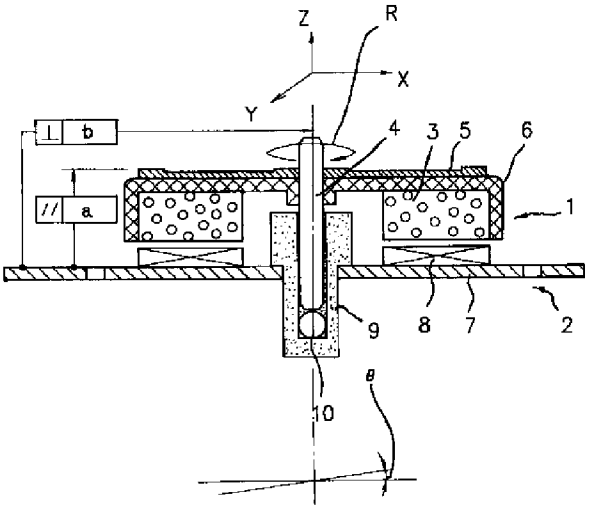
[Drawing 7]



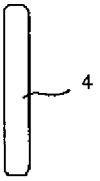
[Drawing 8]



[Drawing 9]

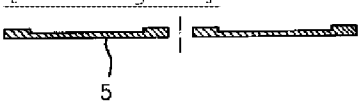


[Drawing 11]

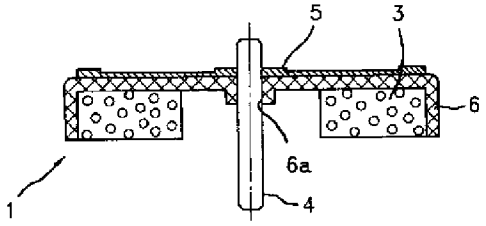


[Drawing 12]

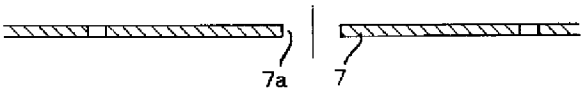
[Drawing 13]



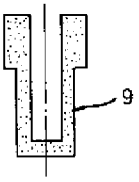
[Drawing 14]



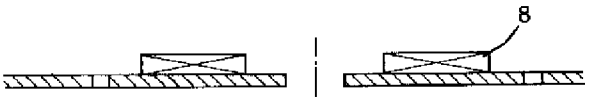
[Drawing 15]



[Drawing 17]



[Drawing 16]



[Drawing 18]